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#P 3611 #6

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# TRANSMITTAL FORM

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| | |
|---|---|
| Application Number | 09/824,980 |
| Filing Date | April 3, 2001 |
| First Named Inventor | Donald J. Williams et al. |
| Art Unit | 3611 |
| Examiner Name | Daniel G. Depumpo |
| Total Number of Pages in This Submission | Attorney Docket Number: 3174-000008 |

**ENCLOSURES** ***(check all that apply)***

- ☒ Fee Transmittal Form
  - ☒ Fee Attached
- ☐ Amendment / Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
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  - ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
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- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
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- ☐ After Allowance Communication to Technology Center (TC)
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☒ Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- ☐ Proprietary Information
- ☐ Status Letter
- ☒ Other Enclosure(s) *(please identify below)*:
  **Appelant's Brief in triplicate; and Return Postcard**

**Remarks** The Commissioner is hereby authorized to charge any additional fees that may be required under 37 CFR 1.16 or 1.17 to Deposit Account No. 08-0750. A duplicate copy of this sheet is enclosed.

**SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT**

| | | | |
|---|---|---|---|
| Firm or Individual name | Harness, Dickey & Pierce, P.L.C. | Attorney Name: Michael D. Wiggins | Reg. No.: 34,754 |
| Signature | Michael D Wiggins | | |
| Date | June 1, 2004 | | |

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# FEE TRANSMITTAL for FY 2004

*Effective 10/01/2003. Patent fees are subject to annual revision.*

☐ Applicant claims small entity status. See 37 CFR 1.27

**TOTAL AMOUNT OF PAYMENT** ($) 330

| *Complete if Known* | |
|---|---|
| Application Number | 09/824,980 |
| Filing Date | April 3, 2001 |
| First Named Inventor | Donald J. Williams et al. |
| Examiner Name | Daniel G. Depumpo |
| Art Unit | 3611 |
| Attorney Docket No. | 3174-000008 |

## METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

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Deposit Account Name: Harness, Dickey & Pierce, P.L.C.

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## FEE CALCULATION

### 1. BASIC FILING FEE

| Large Entity Fee Code | Large Entity Fee ($) | Small Entity Fee Code | Small Entity Fee ($) | Fee Description | Fee Paid |
|---|---|---|---|---|---|
| 1001 | 770 | 2001 | 385 | Utility filing fee | |
| 1002 | 340 | 2002 | 170 | Design filing fee | |
| 1003 | 530 | 2003 | 265 | Plant filing fee | |
| 1004 | 770 | 2004 | 385 | Reissue filing fee | |
| 1005 | 160 | 2005 | 80 | Provisional filing fee | |

SUBTOTAL (1) ($) 0

### 2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

| | | | Extra Claims | | Fee from below | | Fee Paid |
|---|---|---|---|---|---|---|---|
| Total Claims | | -20 ** | = 0 | X | | = | 0 |
| Independent Claims | | -3 ** | = 0 | X | | = | 0 |
| Multiple Dependent | | | | X | | = | 0 |

| Large Entity Fee Code | Large Entity Fee ($) | Small Entity Fee Code | Small Entity Fee ($) | Fee Description |
|---|---|---|---|---|
| 1202 | 18 | 2202 | 9 | Claims in excess of 20 |
| 1201 | 86 | 2201 | 43 | Independent claims in excess of 3 |
| 1203 | 290 | 2203 | 145 | Multiple dependent claim, if not paid |
| 1204 | 86 | 2204 | 43 | ** Reissue independent claims over original patent |
| 1205 | 18 | 2205 | 9 | ** Reissue claims in excess of 20 and over original patent |

SUBTOTAL (2) ($) 0

**or number previously paid, if greater; For Reissues, see above*

## FEE CALCULATION (continued)

### 3. ADDITIONAL FEES

| Large Entity Fee Code | Large Entity Fee ($) | Small Entity Fee Code | Small Entity Fee ($) | Fee Description | Fee Paid |
|---|---|---|---|---|---|
| 1051 | 130 | 2051 | 65 | Surcharge - late filing fee or oath | |
| 1052 | 50 | 2052 | 25 | Surcharge - late provisional filing fee or cover sheet. | |
| 1053 | 130 | 1053 | 130 | Non-English specification | |
| 1812 | 2,520 | 1812 | 2,520 | For filing a request for reexamination | |
| 1804 | 920* | 1804 | 920* | Requesting publication of SIR prior to Examiner action | |
| 1805 | 1,840* | 1805 | 1,840* | Requesting publication of SIR after Examiner action | |
| 1251 | 110 | 2251 | 55 | Extension for reply within first month | |
| 1252 | 420 | 2252 | 210 | Extension for reply within second month | |
| 1253 | 950 | 2253 | 475 | Extension for reply within third month | |
| 1254 | 1,480 | 2254 | 740 | Extension for reply within fourth month | |
| 1255 | 2,010 | 2255 | 1,005 | Extension for reply within fifth month | |
| 1401 | 330 | 2401 | 165 | Notice of Appeal | |
| 1402 | 330 | 2402 | 165 | Filing a brief in support of an appeal | 330 |
| 1403 | 290 | 2403 | 145 | Request for oral hearing | |
| 1451 | 1,510 | 1451 | 1,510 | Petition to institute a public use proceeding | |
| 1452 | 110 | 2452 | 55 | Petition to revive – unavoidable | |
| 1453 | 1,330 | 2453 | 665 | Petition to revive – unintentional | |
| 1501 | 1,330 | 2501 | 665 | Utility issue fee (or reissue) | |
| 1502 | 480 | 2502 | 240 | Design issue fee | |
| 1503 | 640 | 2503 | 320 | Plant issue fee | |
| 1460 | 130 | 1460 | 130 | Petitions to the Commissioner | |
| 1807 | 50 | 1807 | 50 | Processing fee under 37 CFR 1.17 (q) | |
| 1806 | 180 | 1806 | 180 | Submission of Information Disclosure Stmt | |
| 8021 | 40 | 8021 | 40 | Recording each patent assignment per property (times number of properties) | |
| 1809 | 770 | 2809 | 385 | Filing a submission after final rejection (37 CFR § 1.129(a)) | |
| 1810 | 770 | 2810 | 385 | For each additional invention to be examined (37 CFR § 1.129(b)) | |
| 1801 | 770 | 2801 | 385 | Request for Continued Examination (RCE) | |
| 1802 | 900 | 1802 | 900 | Request for expedited examination of a design application | |

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 330

## SUBMITTED BY

Complete *(if applicable)*

| | | | | | |
|---|---|---|---|---|---|
| *Name (Print/Type)* | Michael D. Wiggins | *Registration No. (Attorney/Agent)* | 34,754 | *Telephone* | 248-641-1211 |
| *Signature* | Michael D Wiggins | | | *Date* | June 1, 2004 |

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**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**
**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

**Appeal No.** _____

| | |
|---|---|
| Application No.: | 09/824,980 |
| Filing Date: | April 3, 2001 |
| Applicant: | Donald J. Williams et al. |
| Group Art Unit: | 3611 |
| Examiner: | Daniel G. Depumpo |
| Title: | ELECTRIC POWER STEERING SYSTEM INCLUDING A SEGMENTED STATOR SWITCHED RELUCTANCE MOTOR |
| Attorney Docket: | 3174-000008 |

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Director of The United States Patent and Trademark Office
P.O. Box 1450
Alexandria, Virginia 22313-1450

## APPELLANT'S BRIEF

# TABLE OF CONTENTS

## BRIEF ON BEHALF OF APPELLANT

This is an appeal from the action of the Examiner dated October 7, 2003, finally rejecting Claims 1 – 23. Copies of the claims appealed are attached as an appendix.


## I. REAL PARTY IN INTEREST

The real party in interest in the present application is Emerson Electric Co. (Assignee).

## II. RELATED APPEALS AND INTERFERENCES

There are presently two related appeals which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal. These appeals include U.S. App. Serial No. 09/803,876, filed March 12, 2001 (Notice of Appeal filed April 8, 2004) and U.S. App. Serial No. 09/817,559, filed March 26, 2001 (Notice of Appeal filed April 8, 2004)

## III. STATUS OF THE CLAIMS

Claims 1 – 23 stand finally rejected.

## IV. STATUS OF AMENDMENTS

All of the amendments have been entered in this application.

## V. SUMMARY OF THE INVENTION

The present invention provides an electric power steering system for a vehicle. The electric power steering system includes a steering wheel and a steering shaft connected to the steering wheel. A switched reluctance motor is coupled to the steering shaft for reducing driver effort that is required to turn the steering wheel. The switched reluctance motor includes a stator having a plurality of circumferentially-spaced stator segment assemblies. The stator segments assemblies each include a stack of stator plates forming a stator segment core and winding wire wound around the stator segment core. A rotor defines a plurality of rotor poles. The rotor tends to rotate relative to the stator to maximize the inductance of an energized winding. A drive circuit energizes the winding wire around each stator segment assembly based on a rotational position of the rotor.

In other features, each of the stator segment assemblies define a salient stator pole that extends in a radially inward direction. Inter-pole stator slots are defined between adjacent stator segment assemblies. The winding wire is wound around the stator segment core to achieve a slot fill of between 70 and 95%.

In another feature, each of the stator plates of the stator assemblies has a generally "T"-shaped cross-section, a radially outer rim section and a tooth section that extends radially inwardly from a center portion of the radially outer rim section.

## VI. ISSUES

A. Whether the combination of Kliman et al. '089 in view of Applicants' admitted prior art (APA) and further in view of Nishiyama et al. '153 establish a prima facie case of obviousness under 35 U.S.C. § 103(a), with respect to claims 1 – 5 and 8.

B. Whether the combination of Kliman et al. '089, APA and Nishiyama et al. '153 as applied to claims 1 – 5 and 8, and further in view of McCann '591 and Ackermann '678 establish a prima facie case of obviousness under 35 U.S.C. § 103(a), with respect to claims 9 – 13, 16 – 19, 22 and 23.

C. Whether the combination of Kliman et al. '089, APA and Nishiyama et al. '153 as applied to claims 1 – 5, 8 – 13, 16 – 19 and 22, and further in view of Trago et al. '661 establish a prima facie case of obviousness under 35 U.S.C. § 103(a), with respect to claim 6.

D. Whether the combination of Kliman et al. '089, APA, Nishiyama et al. '153, McCann '591 and Ackermann '678 as applied to claims 9 – 13, 16 – 19, 22 and 23, and further in view of Trago et al. '661 establish a prima facie case of obviousness under 35 U.S.C. § 103(a), with respect to claims 14 and 20.

E. Whether the combination of Kliman et al. '089, APA and Nishiyama et al. '153 as applied to claims 1 – 5, 8 – 13, 16 – 19 and 22, and further in view of Mitsui '309 establish a prima facie case of obviousness under 35 U.S.C. § 103(a), with respect to claim 7.

F. Whether the combination of Kliman et al. '089, APA, Nishiyama et al. '153, McCann '591 and Ackermann '678 as applied to claims 9 – 13, 16 – 19, 22 and 23, and further in view of Mitsui '309 establish a prima facie case of obviousness under 35 U.S.C. § 103(a), with respect to claims 15 and 21.

## VII. GROUPING OF CLAIMS

Claims 1 – 5, 7 and 8 stand or fall together as set forth in sections A and E of the following arguments.

Claim 6 stands or falls by itself as discussed in section C of the following arguments.

Claims 9 – 13 and 15 stand or fall together as set forth in sections B and F of the following arguments.

Claim 14 stands or falls by itself as discussed in section D of the following arguments.

Claims 16 – 19, 21 and 22 stand or fall together as set forth in sections B and F of the following arguments.

Claim 20 stands or falls by itself as discussed in section D of the following arguments.

Claim 23 stands or falls by itself as discussed in section B of the following arguments.

## VIII. ARGUMENTS

### A. The combination of Kliman et al. '089 in view of Applicants' admitted prior art (APA) and further in view of Nishiyama et al. '153 does not render obvious the invention of claims 1 – 5 and 8.

At the outset, Applicants note that independent claim 1 claims an electric power steering system that includes:

> "...a switched reluctance motor coupled to said steering shaft ..., wherein said switched reluctance motor includes a stator including a plurality of circumferentially-spaced stator segment assemblies..."

Applicants further note that none of the prior art references cited by the Examiner are directed toward power steering systems.

In Section 4 of Paper No. 6, the Examiner has falsely asserted that "Kliman discloses the use of a switched reluctance motor (col. 1, line 51 and col. 2, lines 19) in a power steering system (col. 1, line 37)." More specifically, the language cited by the Examiner (col. 1, line 37) describes operation of a switched reluctance electric machine and does not include any language directed toward any type of power steering system.

In fact, Kliman et al. discloses a fault management system for a switched reluctance motor (Abstract) and is in no way directed toward a power steering system. Further, Kliman et al. is completely silent as to applications that could implement a switched reluctance motor and is specifically silent as to an electric power steering system. Therefore, Kliman et al. fails to teach or suggest an electric power steering system that includes a switched reluctance machine with a segmented stator.

Nishiyama et al. does not cure the deficient teachings of Kliman et al. Nishiyama et al. does not teach or suggest a power steering system that implements a switched reluctance electric machine. Further, it should be noted that Nishiyama et al. discloses a permanent magnet electric machine, which is a wholly different type of machine than a switched reluctance electric machine.

Applicants' admitted prior art (APA) also fails to cure the deficient teachings of both Kliman et al. and Nishiyama et al. More specifically, Applicant's APA outlines the reasons why traditional switched reluctance electric machines **are not** implemented in power steering systems.

In prior responses, Applicants identified similar, significantly older references that support the same teachings as those found in Kliman et al. and Nishiyama et al. In particular, switched reluctance motors with non-segmented stators that are similar to those taught by Kliman et al. have been around since the mid 1800's. Permanent magnet motors with segmented stators that are similar to those shown in Nishimaya et al. are shown in Sheldon (U.S. Patent No. 2,688,103, which was issued in 1952).

While the age of the references, standing alone, is not persuasive on the issue of non-obviousness, the age of the references coupled with the failure to solve the problem in

light of the presumed knowledge of the references is persuasive on the issue of obviousness. As stated in **In re Neal**:

> Appellant points out that the references are "quite old" and considers that an indication that this combination would not have been obvious. Such a position is not impressive "absent some showing that the art tried and failed to solve some problem notwithstanding its presumed knowledge of the references." **In re McGuire**, 57 CCPA 706, 712, 416 F.2d 1322, 1327, 163 USPQ 417, 421 (1969).

**In re Neal** 179 USPQ 56, 57 (CCPA 1973).

Applicants segmented the stator of the switched reluctance machine to improve the electromagnetic characteristics of the stator segments, which makes sensorless control easier to implement. Successfully implementing sensorless control in switched reluctance machines has been a long standing problem in the art of switched reluctance machines.

Despite known problems relating to sensorless control techniques and the presumed knowledge of the references, none of the prior art references have proposed an electric power steering system that includes a switched reluctance machine with a segmented stator as set forth in claim 1. Segmenting the stator as taught by Applicants allows the stator segments to be precisely wound. The precise winding enables the inductance and resistance characteristics to be controlled from one stator segment to another and from one machine to another. The controlled inductance and resistance characteristics, in turn, solves the problem of implementing sensorless control systems.

Applicants further note that there are several significant problems in the Examiner's application of the prior art references. First, Kliman et al. is directed to the problem of detecting and isolating faults in a switched reluctance machine (col. 1, lines 6-11). Kliman et al. does not address the problem of making the stator of a switched reluctance machine

easier to wind. It is therefore unclear why one would look to Nishiyama et al., which relates to a different type of machine, to solve problems relating to sensorless rotor position sensing. Further, the Examiner has alleged that it would be obvious to segment the stator in Kliman et al. because segmenting the stator is common in the machine art. This statement is not true with respect to switched reluctance machines. Applicants are aware of no switched reluctance machines that are segmented to allow precise winding and have high slot fill.

The Examiner's reasoning is exactly the type of speculation that formed the basis for reversal of the Examiner and the Board in **In re Jones**:

> Conspicuously missing from this record is any evidence, other than the PTO's speculation (if it be called evidence) that one of ordinary skill in the herbicidal art would have been motivated to make the modifications of the prior art salts necessary to arrive at the claimed 2-(2 '-aminoethoxy) ethanol salt... We conclude that the PTO did not establish a prima facie case of obviousness.

**In re Fine** also rejected this reasoning. There, the prior art reference related to a similar device – namely gas chromatographs. **Id.** The prior art chromatograph detected sulfur while Applicants' chromatograph detected nitrogen. **Id.**

Both **In re Fine** and **In re Jones** reject the proposition that the teaching, suggestion or motivation required by §103 is present simply because the references all relate to the same broad category of art or that unsupported general knowledge of one skilled in the art can be relied upon. The Examiner is essentially asserting that it would be obvious for skilled artisans to try the features of one device in another similar device. The CAFC expressly rejected the "obvious to try theory" in **In re Fine** at 1598.

The sole motivation for making the proposed combination is provided by Applicants' specification, which is impermissible hindsight reconstruction. As succinctly stated by the CAFC:

> But this court has said, "To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher." W. L. Gore , 721 F.2d at 1553, 220 USPQ at 312-13. It is essential that "the decisionmaker forget what he or she has been taught at trial about the claimed invention and cast the mind back to the time the invention was made . . . to occupy the mind of one skilled in the art who is presented only with the references, and who is normally guided by the then-accepted wisdom in the art." Id . One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

**In re Fine** at 1600.

With regard to claims 2 – 5 and 8, Applicants note that each ultimately depends from claim 1, which defines over the prior art as discussed above. Therefore, claims 2 – 5 and 8 also define over the prior art.

In view of the foregoing, the combination of the references fail to teach or suggest all of the elements of the claim, as set forth. Therefore, Applicants respectfully request that this Board overturn the Examiner's rejection of claims 1 – 5 and 8.

**B. The combination of Kliman et al. '089, APA and Nishiyama et al. '153 as applied to claims 1 – 5 and 8, and further in view of McCann '591 and Ackermann '678 does not render obvious the invention of claims 9 – 13, 16 – 19, 22 and 23.**

Applicants incorporate the above discussion regarding claims 1 – 5 and 8.

At the outset, Applicants note that independent claim 9 claims an electric power steering system that includes:

> "a switched reluctance motor coupled to said steering shaft...; and
> a stator for said switched reluctance motor including a plurality of circumferentially-spaced stator segment assemblies ..., wherein inter-pole stator slots are defined between adjacent stator segment assemblies,... and winding wire that is wound around said stator segment core and that defines a slot fill between 70 and 95%."

Independent claim 16 claims an electric power steering system that includes:

> "a switched reluctance motor that is coupled to said steering shaft ... including ... a stator that is mounted on an inner surface of said motor housing, said stator including a plurality of circumferentially-spaced stator segment assemblies, wherein said stator segment assemblies include a stack of stator plates forming a stator segment core and winding wire that is wound around said stator segment core and that defines a slot fill that is between 70 and 95%, wherein each of said stator plates has a generally "T"-shaped cross-section, a radially outer rim section, and a tooth section that extends radially inwardly from a center portion of said radially outer rim section.

As discussed in detail above, none of the prior art references are directed toward power steering systems. Further, none of the prior art references (Kliman et al., Nishiyama et al. or Applicants' APA) teach or suggest implementing a switched reluctance electric machine in a power steering system and more specifically, a switched reluctance electric machine having segmented stator assemblies.

Applicants note that neither McCann nor Ackermann et al. cure the deficient teachings of Kliman et al., Nishiyama et al. and Applicants' APA. Although McCann discusses a switched reluctance motor with indirect position sensing, McCann fails to teach or suggest a power steering system that includes a switched reluctance electric machine having segmented stator assemblies. McCann is specifically limited to disclosing a switched reluctance electric machine having a solid stator.

Ackermann et al. is directed toward a method of constructing a salient motor pole for an electric machine to increase slot fill. More importantly, however, Ackermann et al. does not teach or suggest implementing a switched reluctance machine having segmented stator assemblies in a power steering system. Therefore, Ackermann et al. also fails to cure the deficient teachings of Kliman et al., Nishiyama et al. and Applicants' APA.

Further, neither McCann nor Ackermann show, teach or suggest a switched reluctance electric machine with a segmented stator and with a slot fill of 70-95%. McCann shows a switched reluctance machine with a non-segmented stator. As such, either transfer winding or needle winding would typically be used to wind the stator teeth. These methods are generally limited to less than 65% slot fill (Specification at [0011]) and certainly cannot obtain the claimed slot fill of 70-95%. Ackermann states that salient pole motors have slot fills of 40-50%. However, induction machines, according to Ackerman, have slot fills approaching 70% because bobbin and oscillating guns can be used col. 2, lines 16-19). Ackerman goes on to describe a method for increasing slot fill of **salient pole machines** substantially higher than slot fills obtainable by prior art techniques (e.g. substantially higher than 40-50%) (col. 3, lines 7-27, col. 6, lines 42-45). Ackermann does

not improve slot fill of induction machines. Therefore, neither Ackermann nor McCann teach a segmented switched reluctance machine with 70-95% slot fill.

With regard to claims 10 – 13, 17 – 19 and 22, Applicants note that each ultimately depends from either claim 9 or claim 16, which define over the prior art as discussed above. Therefore, claims 10 – 13, 17 – 19 and 22 also define over the prior art.

In view of the foregoing, the combination of the references fail to teach or suggest all of the elements of the claim, as set forth. Therefore, Applicants respectfully request that this Board overturn the Examiner's rejection of claims 9 – 13, 16 – 19 and 22.

Claim 23 depends from claim 1, which is discussed in detail above. Because claim 1 defines over the prior art, claim 23 also defines over the prior art and Applicants respectfully request that this Board overturn the Examiner's rejection of claim 23.

**C. The combination of Kliman et al. '089, APA and Nishiyama et al. '153 as applied to claims 1 – 5, 8 – 13, 16 – 19 and 22, and further in view of Trago et al. '661 does not render obvious the invention of claim 6.**

Applicants incorporate the comments set forth above with regard to claims 1 – 5, 8 – 13, 16 – 19 and 22.

At the outset, Applicants note that claim 6 ultimately depends from claim 1, which defines over the prior art, as discussed in detail above. Therefore, claim 6 also defines over the prior art.

Claim 6 includes first and second end caps connected to opposite axial ends of the stator segment core and first and second end cap retainer sections that connect the first and second end caps. As provided in claim 1, the stator is made up of a plurality of stator segments assemblies, each of which include a stator segment core. As a result, each

stator segment core includes the end caps and the retainer sections.

Trago et al. fails to teach or suggest end caps and retainer sections for individual stator segment cores of a stator. The disclosure of Trago et al. is limited to a single-piece stator (see Figure 7) and motor housing end caps (25,26) that house the motor components.

Accordingly, the combination of the references fail to teach or suggest all of the elements of the claim, as set forth. Therefore, Applicants respectfully request that this Board overturn the Examiner's rejection of claim 6.

**D. The combination of Kliman et al. '089, APA, Nishiyama et al. '153, McCann '591 and Ackermann '678 as applied to claims 9 – 13, 16 – 19, 22 and 23, and further in view of Trago et al. '661 does not ..... render obvious the invention of claims 14 and 20.**

Applicants incorporate the comments set forth above with regard to claims 1 – 5, 8 – 13, 16 – 19 and 22.

At the outset, Applicants note that claims 14 and 20 ultimately depend from claims 9 and 16, respectively, which define over the prior art, as discussed in detail above. Therefore, claims 14 and 20 also define over the prior art.

Claims 14 and 20 include first and second end caps connected to opposite axial ends of the stator segment core and first and second end cap retainer sections that connect the first and second end caps. As provided in claims 9 and 16, the stator is made up of a plurality of stator segments assemblies, each of which include a stator segment core. As a result, each stator segment core includes the end caps and the retainer sections.

As discussed in detail above, Trago et al. fails to teach or suggest end caps and retainer sections for individual stator segment cores of a stator. The disclosure of Trago et al. is limited to a single-piece stator (see Figure 7) and motor housing end caps (25,26) that house the motor components.

Accordingly, the combination of the references fail to teach or suggest all of the elements of the claim, as set forth. Therefore, Applicants respectfully request that this Board overturn the Examiner's rejections of claims 14 and 20.

**E. The combination of Kliman et al. '089, APA and Nishiyama et al. '153 as applied to claims 1 – 5, 8 – 13, 16 – 19 and 22, and further in view of Mitsui '309 does not render obvious the invention of claim 7.**

Applicants incorporate the comments set forth above with regard to claims 1 – 5, 8 – 13, 16 – 19 and 22.

Applicants note that claim 7 depends from claim 1, which defines over the prior art, as discussed in detail above. Therefore, claim 7 also defines over the prior art. Accordingly, Applicants respectfully request that this Board overturn the Examiner's rejection of claim 7.

**F. The combination of Kliman et al. '089, APA, Nishiyama et al. '153, McCann '591 and Ackermann '678 as applied to claims 9 – 13, 16 – 19, 22 and 23, and further in view of Mitsui '309 does not render obvious the invention of claims 15 and 21.**

Applicants incorporate the comments set forth above with regard to claims 19 – 13, 16 – 19, 22 and 23.

Applicants note that claims 15 and 21 ultimately depend from claims 9 and 16,

respectively, which define over the prior art, as discussed in detail above. Therefore, claims 15 and 21 also define over the prior art. Accordingly, Applicants respectfully request that this Board overturn the Examiner's rejections of claims 15 and 21.

## IX. CONCLUSION

In view of the above presented discussion, Applicants believe that the pending claims are patentably distinguishable over the art cited by the Examiner. Accordingly, Applicants respectfully request that this Board reverse the final rejection of claims 1 – 23.

Please charge the amount of $330 for filing a brief in support of this appeal and charge any deficiency or credit any overpayment pursuant to 37 C.F.R. § 1.16 or § 1.17 to Deposit Account No. 08-0750.

Respectfully submitted,

Dated: 6/1/04

By: _____
Michael D. Wiggins, Reg. No. 34,754
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Enclosures: Three (3) copies of Appellant's Brief

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## APPENDIX

1. An electric power steering system for a vehicle comprising:

a steering wheel;

a steering shaft connected to said steering wheel; and

a switched reluctance motor coupled to said steering shaft for reducing driver effort that is required to turn said steering wheel, wherein said switched reluctance motor includes a stator including a plurality of circumferentially-spaced stator segment assemblies that include a stack of stator plates forming a stator segment core and winding wire wound around said stator segment core, a rotor defining a plurality of rotor poles, wherein said rotor tends to rotate relative to said stator to maximize the inductance of an energized winding, and a drive circuit that energizes said winding wire around said stator segment assemblies based on a rotational position of said rotor.

2. The electric power steering system of claim 1 further comprising:

a worm gear connected to said steering shaft; and

a worm threadably engaged to said worm gear, wherein said rotor of said switched reluctance motor is connected to said worm.

3. The electric power steering system of claim 1 wherein each of said stator plates includes:

a radially outer rim section; and

a tooth section that extends radially inwardly from a center portion of said radially outer rim section.

4. The electric power steering system of claim 3 further comprising:

an insulation layer located between said winding wire and said stator segment core.

5. The electric power steering system of claim 1 further comprising:

projections extending from opposite sides of a radially inner end of said tooth section.

6. The electric power steering system of claim 5 further comprising:

first and second end caps connected to opposite axial ends of said stator segment core; and

first and second end cap retainer sections that extend along said projections and that connect said first and second end caps,

wherein said first and second end caps and said first and second end cap retainer sections reduce movement of said winding wire during use.

7. The electric power steering system of claim 1 wherein said stator plates of said stator segment core include radial and lateral slits and first and second central portions that are deformed using a punch and press fit to hold said stack of stator plates together.

8. The electric power steering system of claim 1 wherein said drive circuit senses rotor position using sensorless rotor position techniques.

9. An electric power steering system comprising:

a steering wheel;

a steering shaft connected to said steering wheel;

a switched reluctance motor coupled to said steering shaft for reducing driver effort that is required to turn said steering wheel; and

a stator for said switched reluctance motor including a plurality of circumferentially-spaced stator segment assemblies that are arranged around an inner surface of said motor housing, each of said stators segment assemblies defining a salient stator pole that extends in a radially inward direction, wherein inter-pole stator slots are defined between adjacent stator segment assemblies, and said stator segment assemblies including a stack of stator plates forming a stator segment core and winding wire that is wound around said stator segment core and that defines a slot fill between 70 and 95%.

10. The electric power steering system of claim 9 further comprising:

a worm gear connected to said steering shaft; and

a worm threadably engaged to said worm gear, wherein said rotor of said switched reluctance motor is connected to said worm.

11. The electric power steering system of claim 9 wherein each of said stator plates includes:

a radially outer rim section; and

a tooth section that extends radially inwardly from a center portion of said radially outer rim section.

12. The electric power steering system of claim 11 further comprising:

an insulation layer located between said winding wire and said stator segment core.

13. The electric power steering system of claim 9 further comprising:

projections extending from opposite sides of a radially inner end of said tooth section.

14. The electric power steering system of claim 13 further comprising:

first and second end caps connected to opposite axial ends of said stator segment core; and

first and second end cap retainer sections that extend along said projections and that connect said first and second end caps,

wherein said first and second end caps and said first and second axial end cap retainer sections reduce movement of said winding wire during use.

15. The electric power steering system of claim 9 wherein said stator plates of said stator segment core include radial and lateral slits and first and second central portions that are deformed to hold said stator segment core together.

16. An electric power steering system for a vehicle comprising:

a steering wheel;

a steering shaft connected to said steering wheel; and

a switched reluctance motor that is coupled to said steering shaft to reduce driver effort that is required to turn said steering wheel, said switched reluctance motor including a motor housing, a rotor that rotates relative to said motor housing, and a stator that is mounted on an inner surface of said motor housing, said stator including a plurality of circumferentially-spaced stator segment assemblies, wherein said stator segment assemblies include a stack of stator plates forming a stator segment core and winding wire that is wound around said stator segment core and that defines a slot fill that is between 70 and 95%, wherein each of said stator plates has a generally "T"-shaped cross-section, a radially outer rim section, and a tooth section that extends radially inwardly from a center portion of said radially outer rim section.

17. The electric power steering system of claim 16 further comprising:

a worm gear connected to said steering shaft; and

a worm threadably engaged to said worm gear, wherein said rotor of switched reluctance motor is connected to said worm.

18. The electric power steering system of claim 16 further comprising:

an insulation layer located between said winding wire and said stator segment cores.

19. The electric power steering system of claim 16 further comprising:

projections extending from opposite sides of a radially inner end of said tooth section.

20. The electric power steering system of claim 19 further comprising:

first and second end caps connected to opposite axial ends of said stator segment core; and

first and second end cap retainer sections that extend along said projections and that connect said first and second end caps,

wherein said first and second end caps and said first and second end cap retainer sections reduce movement of said winding wire during use.

21. The electric power steering system of claim 16 wherein said stator plates of said stator segment core include radial and lateral slits and first and second central portions that are deformed to hold said stator segment core together.

22. The electric power steering system of claim 16 further comprising:

a drive circuit connected to said winding wire of said stator segment assemblies, wherein said drive circuit senses rotor position using sensorless rotor position techniques.

23. The electric power steering system of claim 1 wherein said winding wire defines a slot fill that is between 70 and 95%.